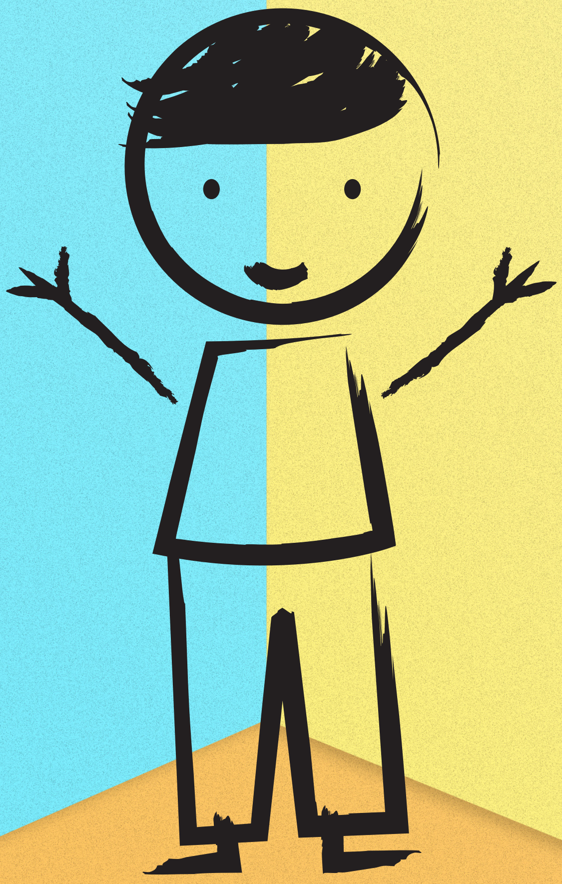
CLASS X

# SCIENCE

## TERM-2 ACTIVITIES

'SIMPLIFIED'



DESIGNED WITH ❤

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# CH- CARBON AND ITS COMPOUNDS

## Activity 4.2

- Calculate the difference in the formulae and molecular masses for (a) $CH_3OH$ and $C_2H_5OH$ (b) $C_2H_5OH$ and $C_3H_7OH$, and (c) $C_3H_7OH$ and $C_4H_9OH$.
- Is there any similarity in these three?
- Arrange these alcohols in the order of increasing carbon atoms to get a family. Can we call this family a homologous series?
- Generate the homologous series for compounds containing up to four carbons for the other functional groups given in Table 4.3.

Answer:

The atomic mass of C = 12 u, H = 1 u and O = 16 u. So, molecular mass of $CH_3OH$ = 12 + 3 × 1 + 16 + 1 = **32 u.** The molecular mass of $C_2H_5OH$ = 12× 2 + 5 × 1 + 16 + 1 = **46 u**. The molecular mass of $C_3H_7OH$ = 12 × 3 + 7 × 1 + 16 + 1 = **60 u.** And molecular mass of $C_4H_9OH$ = 12 × 4 + 9 × 1 + 16 + 1 = **74 u.**

(*a*) The difference in the molecular formulae of $CH_3OH$ and $C_2H_5OH$ is $CH_2$. The difference in the molecular masses of $CH_3OH$ and $C_2H_5OH$ is 46 – 32 = 14 u.

(*b*) The difference in the molecular formulae of $C_2H_5OH$ and $C_3H_7OH$ is $CH_2$. And the difference in the molecular masses of $C_2H_5OH$ and $C_3H_7OH$ is 60 – 46 = 14 u.

(*c*) The difference in the molecular formulae of $C_3H_7OH$ and $C_4H_9OH$ is $CH_2$. And the difference in the molecular masses of $C_3H_7OH$ and $C_4H_9OH$ is 74 – 60 = 14 u.

(*i*) Yes, there is a similarity in the difference between their molecular formulae and molecular masses. Their molecular formulae differ by $CH_2$ (1 carbon atom and 2 hydrogen atoms), and their molecular masses differ by 14 u.

(*ii*) These alcohols can be arranged in the order of the increasing carbon atoms as follows :
$CH_3OH$, $C_2H_5OH$, $C_3H_7OH$, $C_4H_9OH$

Yes, we can call it a homologous series.

**(REST ALL IMPORTANT ACTIVITIES ARE FROM REDUCED SYLLABUS)**

# CH- PERIODIC CLASSIFICATION

## Activity 5.1

- Looking at its resemblance to alkali metals and the halogen family, try to assign hydrogen a correct position in Mendeléev's Periodic Table.
- To which group and period should hydrogen be assigned?

- Hydrogen has properties similar to alkali metals and the halogen family. But its properties are more similar to the alkali metals as it has the property of losing electrons (electropositive). So, the position of hydrogen in Mendeleev's Periodic Table is correct.
- First group and first period.

## Activity 5.2

- Consider the isotopes of chlorine, Cl-35 and Cl-37.
- Would you place them in different slots because their atomic masses are different?
- Or would you place them in the same position because their chemical properties are the same?

- No. The more fundamental basis of classification is the atomic number. Or would you place them in the same position because their chemical properties are the same?
- Yes. Isotopes are placed in same position asthey have same chemical properties and atomic number.

## Activity 5.3

- How were the positions of cobalt and nickel resolved in the Modern Periodic Table?
- How were the positions of isotopes of various elements decided in the Modern Periodic Table?
- Is it possible to have an element with atomic number 1.5 placed between hydrogen and helium?
- Where do you think should hydrogen be placed in the Modern Periodic Table?

- Modern Periodic Table is based on the atomic number. Thus Cobalt (27) is placed before Nickel (28).
- Isotopes have the same atomic number. So they are placed in the same group.
- No. Because the atomic number is a whole number.
- The position of hydrogen in the Modern Periodic Table is correct.

## Activity 5.4

- Look at the group 1 of the Modern Periodic Table, and name the elements present in it.
- Write down the electronic configuration of the first three elements of group 1.
- What similarity do you find in their electronic configurations?
- How many valence electrons are present in these three elements?

- Group 1 elements: Hydrogen (H), Lithium (Li), Sodium (Na), Potassium (k), Rubidium (Rb), Cesium (Cs) and Francium (Fr).
- (i) Hydrogen: 1 (ii) Lithium: 2, 1 (iii) Sodium: 2, 8,
- They have the same number of valence electrons, i.e. 1.
- 1

## Activity 5.5

- If you look at the Modern Periodic Table (5.6), you will find that the elements Li, Be, B, C, N, O, F, and Ne are present in the second period. Write down their electronic configurations.
- Do these elements also contain the same number of valence electrons?
- Do they contain the same number of shells?

- Li: 2,1; Be: 2, 2; B: 2, 3; C: 2, 4; N: 2, 5; O: 2, 6; F: 2,7; Ne: 2, 8
- No
- Yes

## Activity 5.6

- How do you calculate the valency of an element from its electronic configuration?
- What is the valency of magnesium with atomic number 12 and sulphur with atomic number 16?
- Similarly find out the valencies of the first twenty elements.
- How does the valency vary in a period on going from left to right?
- How does the valency vary in going down a group?

- Valency of metal: It is the same as the number of valence electrons.

  Valency of non-metal: It is calculated by subtracting the number of valence electrons from 8.

- Magnesium: 2, 8, 2. It is a metal. So valency= 2. Sulphur: 2, 8, 6. It is a non-metal. So valency= 8-6 = 2
- Valency first increases 1 to 4 then decreases from 4 to 0 (1, 2, 3, 4, 3, 2, 1, 0)
- Valency remains the same because valence electrons do not change on going down in a group.

## Activity 5.7

- Atomic radii of the elements of the second period are given below:

| Period II elements : | B | Be | O | N | Li | C |
|---|---|---|---|---|---|---|
| Atomic radius (pm) : | 88 | 111 | 66 | 74 | 152 | 77 |

- Arrange them in decreasing order of their atomic radii.
- Are the elements now arranged in the pattern of a period in the Periodic Table?
- Which elements have the largest and the smallest atoms?
- How does the atomic radius change as you go from left to right in a period?

- Li Be B C N O
- Yes
- Lithium (Li) has the largest atoms (152 pm). Oxygen (0) has the smallest atoms (66pm).
- The atomic radius decreases

## Activity 5.8

- Study the variation in the atomic radii of first group elements given below and arrange them in an increasing order.

| Group 1 Elements : | Na | Li | Rb | Cs | K |
|---|---|---|---|---|---|
| Atomic Radius (pm): | 186 | 152 | 244 | 262 | 231 |

- Name the elements which have the smallest and the largest atoms.
- How does the atomic size vary as you go down a group?

- Li Na K Rb Cs
- Li has the smallest atom and Cs has the largest atom.
- Atomic size increases down the group due to the addition of new shells.

## Activity 5.9

- Examine elements of the third period and classify them as metals and non-metals.
- On which side of the Periodic Table do you find the metals?
- On which side of the Periodic Table do you find the non-metals?

| Elements with Atomic No. | Configuration | Metal / Non-metal |
|---|---|---|
| Na (11) | 2, 8, 1 | Metal |
| Mg (12) | 2, 8, 2 | Metal |
| Al (13) | 2, 8, 3 | Metal |
| Si (14) | 2, 8, 4 | Metalloid |
| P (15) | 2, 8, 5 | Non-Metal |
| S (16) | 2, 8, 6 | Non-Metal |
| Cl (17) | 2, 8, 7 | Non-Metal |
| Ar (18) | 2, 8, 8 | Non-Metal |

- Left
- Right

### Activity 5.10

- How do you think the tendency to lose electrons changes in a group?
- How will this tendency change in a period?

- The tendency to lose electrons increases in a group on going down.
- The tendency to lose electrons decreases on going left to right.

### Activity 5.11

- How would the tendency to gain electrons change as you go from left to right across a period?
- How would the tendency to gain electrons change as you go down a group?

- The tendency to gain electrons increases on going left to right in a period up to 17th group. It decreases in 18th group.
- The tendency to gain the electrons decreases on going down a group.

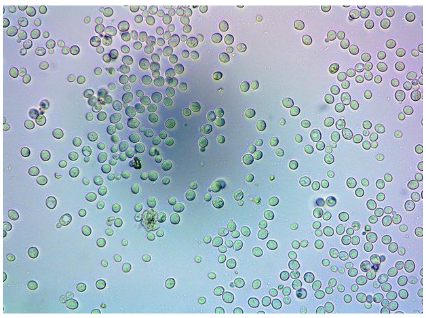
# CH- REPRODUCTION

## Activity 8.1

- Dissolve about 10 gm of sugar in 100 mL of water.
- Take 20 mL of this solution in a test tube and add a pinch of yeast granules to it.
- Put a cotton plug on the mouth of the test tube and keep it in a warm place.
- After 1 or 2 hours, put a small drop of yeast culture from the test tube on a slide and cover it with a coverslip.
- Observe the slide under a microscope.

Yeast is a simple unicellular mold. In a positive way, it produces in germination. Here comes a small stalk of leaven. The genes quickly replicate, and one copy goes to a newly formed plant. Now the shoot separates from the mother's yeast and begins a new life cycle.

The presence of sugar in the solution acts as a catalyst for yeast as it provides them with a source of energy. Here Yeast uses sugar and makes Alcohol by releasing carbon dioxide.



Activity Observation: Under the microscope, we see yeast reproducing by forming buds.

## Activity 8.2

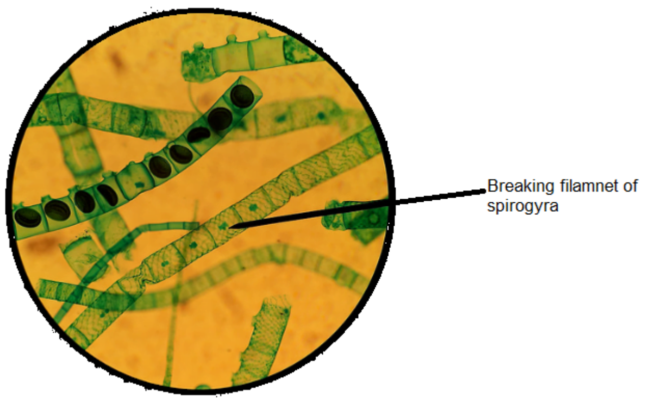
- Wet a slice of bread, and keep it in a cool, moist and dark place.
- Observe the surface of the slice with a magnifying glass.
- Record your observations for a week.

Observation activity: Rhizopus sporulate also releases new particles into the sporangium.

Because like sugar you like yeast, bread carbohydrates and in the presence of water love rhizopus. Rhizopus is a fungus that looks green and black. We also call them bread mold. Rhizopus in a humid environment grows rapidly and multiplies by the formation of seeds. The green mold we see on the old bread is due to the rapid growth and reproduction of Rhizopus.

## Activity 8.4

- Collect water from a lake or pond that appears dark green and contains filamentous structures.
- Put one or two filaments on a slide.
- Put a drop of glycerine on these filaments and cover it with a coverslip.
- Observe the slide under a microscope.
- Can you identify different tissues in the *Spirogyra* filaments?




Work View: We see small fragments of Spirogyra in the microscope.

Spirogyra is an alga blue. It is usually found in clean water. Its long strand breaks down into thin strands and grows into new strands. We call this method of production Separation.

## Activity 8.5

- Take a potato and observe its surface. Can notches be seen?
- Cut the potato into small pieces such that some pieces contain a notch or bud and some do not.
- Spread some cotton on a tray and wet it. Place the potato pieces on this cotton. Note where the pieces with the buds are placed.
- Observe changes taking place in these potato pieces over the next few days. Make sure that the cotton is kept moistened.
- Which are the potato pieces that give rise to fresh green shoots and roots?

Observing Activity: Potato stalks with at least one sprout grow into a plant while potatoes without a slice are light.

Part of the potato tuber we use in the kitchen is a modified stem. It produces by vegetative propagation. Growers plant a potato tuber in the ground that grows into a full-grown crop with many tubers.

Potato buds infact with growing stems. Left on its own, potatoes sprout and grow to full size. So when we cut a potato into portions, Only those parts contain at least a growing shoot.

Conclusion: This process is called vegetative propagation. Vegetable reproduction is a common method we use in crops such as potatoes, rose, mango, etc.

## Activity 8.6

- Select a money-plant.
- Cut some pieces such that they contain at least one leaf.
- Cut out some other portions between two leaves.
- Dip one end of all the pieces in water and observe over the next few days.
- Which ones grow and give rise to fresh leaves?
- What can you conclude from your observations?

Activity Observation: A single-leaf coin survives while a leafless coin dies.

A cash crop is a perennial plant from the region of Asia. We call it the coin because its leaf is like a coin.

Like other plants, the cash crop can reproduce by spreading plants.

When it cuts the plant into pieces, it survives by taking photosynthesis. But if the cut part does not have leaves the plant will not be able to photosynthesize and make its own food. As a result, the plant turns yellow and eventually dies.

## Activity 8.7

- Soak a few seeds of Bengal gram (*chana*) and keep them overnight.
- Drain the excess water and cover the seeds with a wet cloth and leave them for a day. Make sure that the seeds do not become dry.
- Cut open the seeds carefully and observe the different parts.
- Compare your observations with the Fig. 8.9 and see if you can identify all the parts.

Observations: Two seed cotyledons are separated by radicle and pluule formation.

Definition: When immersed in water, the seed breaks off its sleep and begins to grow. A small white tip comes from a seed we call Radicle. Radicle, later, grows into a root.

A few days after the formation of the radicle, another white structure emerges from the seed cell. We call this Plumule. The plumle later becomes green and grows into a shoot.

# CH- ELECTRICITY

**Activity 12.1**

- Set up a circuit as shown in Fig. 12.2, consisting of a nichrome wire XY of length, say 0.5 m, an ammeter, a voltmeter and four cells of 1.5 V each. (Nichrome is an alloy of nickel, chromium, manganese, and iron metals.)



- First use only one cell as the source in the circuit. Note the reading in the ammeter *I*, for the current and reading of the voltmeter *V* for the potential difference across the nichrome wire XY in the circuit. Tabulate them in the Table given.
- Next connect two cells in the circuit and note the respective readings of the ammeter and voltmeter for the values of current through the nichrome wire and potential difference across the nichrome wire.
- Repeat the above steps using three cells and then four cells in the circuit separately.
- Calculate the ratio of *V* to *I* for each pair of potential difference *V* and current *I*.

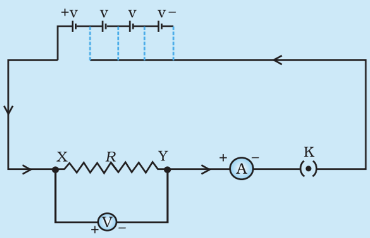



***Figure 12.2*** *Electric circuit for studying Ohm's law*

| S. No. | Number of cells used in the circuit | Current through the nichrome wire, *I* (ampere) | Potential difference across the nichrome wire, *V* (volt) | *V/I* (volt/ampere) |
|---|---|---|---|---|
| 1 | 1 | | | |
| 2 | 2 | | | |
| 3 | 3 | | | |
| 4 | 4 | | | |

- Plot a graph between *V* and *I*, and observe the nature of the graph.

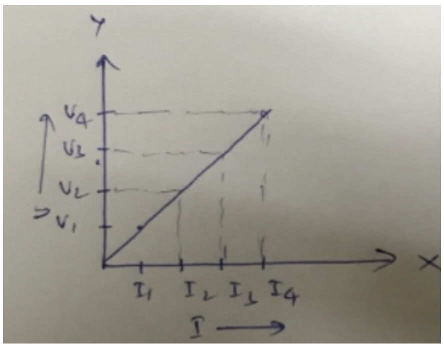
First, only one cell is the voltage source, note down the ammeter and voltmeter readings and fill in the table provided.

Repeat these steps using two, then three then four cells respectively.

When we plot the graph we'll observe that the resistance of the wire is given by R=V/I. And the graph is straight line.

Observation table :

| S.NO | No. of cells | Current | Potential diff | V/I |
|---|---|---|---|---|
| 1. | 1 | $I_1$ | $V_1$ | $V_1/I_1$ |
| 2. | 2 | $I_2$ | $V_2$ | $V_2/I_2$ |
| 3. | 3 | $I_3$ | $V_3$ | $V_3/I_3$ |
| 4. | 4 | $I_4$ | $V_4$ | $V_4/I_4$ |



## Activity 12.2

- Take a nichrome wire, a torch bulb, a 10 W bulb and an ammeter (0 – 5 A range), a plug key and some connecting wires.
- Set up the circuit by connecting four dry cells of 1.5 V each in series with the ammeter leaving a gap XY in the circuit, as shown in Fig. 12.4.

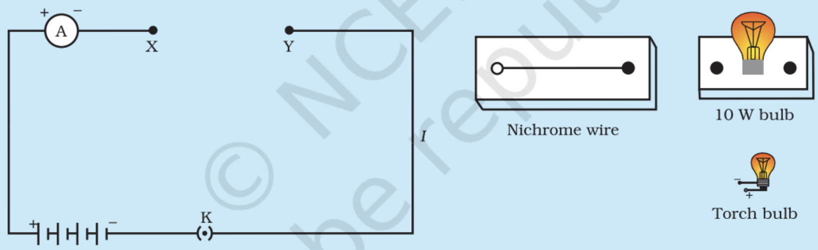



***Figure 12.4***

- Complete the circuit by connecting the nichrome wire in the gap XY. Plug the key. Note down the ammeter reading. Take out the key from the plug. [Note: *Always take out the key from the plug after measuring the current through the circuit.*]
- Replace the nichrome wire with the torch bulb in the circuit and find the current through it by measuring the reading of the ammeter.
- Now repeat the above step with the 10 W bulb in the gap XY.
- Are the ammeter readings different for different components connected in the gap XY? What do the above observations indicate?
- You may repeat this Activity by keeping any material component in the gap. Observe the ammeter readings in each case. Analyse the observations.



The current is different for different components. In certain components, there is easy flow of electric current while the others resist the flow.

Within a conductor, electrons are not completely free to move due to the attraction by atoms. So, resistance is increased and motion of electrons is retarded.

Observation: The current varies in different parts. In some cases, the flow of electrical energy is easier while others oppose the flow. Inside the conductor, electrons are not completely free of movement due to the attraction of atoms. So, resistance increases and the movement of electrons decreases.

## Activity 12.3

- Complete an electric circuit consisting of a cell, an ammeter, a nichrome wire of length $l$ [say, marked (1)] and a plug key, as shown in Fig. 12.5.

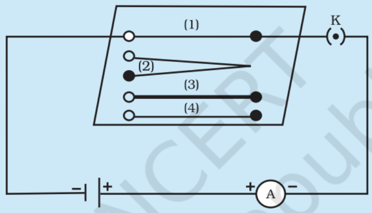



***Figure 12.5*** *Electric circuit to study the factors on which the resistance of conducting wires depends*

- Now, plug the key. Note the current in the ammeter.
- Replace the nichrome wire by another nichrome wire of same thickness but twice the length, that is $2l$ [marked (2) in the Fig. 12.5].
- Note the ammeter reading.
- Now replace the wire by a thicker nichrome wire, of the same length $l$ [marked (3)]. A thicker wire has a larger cross-sectional area. Again note down the current through the circuit.
- Instead of taking a nichrome wire, connect a copper wire [marked (4) in Fig. 12.5] in the circuit. Let the wire be of the same length and same area of cross-section as that of the first nichrome wire [marked (1)]. Note the value of the current.
- Notice the difference in the current in all cases.
- Does the current depend on the length of the conductor?
- Does the current depend on the area of cross-section of the wire used?

When a wire of length 2L is connected, the current is halved.

When the wire of a larger cross section area is connected, current is increased.

When copper wire is connected instead of nichrome, the reading of ammeter i.e current is changed.

## Activity 12.4

- Join three resistors of different values in series. Connect them with a battery, an ammeter and a plug key, as shown in Fig. 12.6. You may use the resistors of values like 1 Ω, 2 Ω, 3 Ω etc., and a battery of 6 V for performing this Activity.
- Plug the key. Note the ammeter reading.
- Change the position of ammeter to anywhere in between the resistors. Note the ammeter reading each time.
- Do you find any change in the value of current through the ammeter?

The current value in the ammeter is the same. that is, in a series of combinations of resistors, the current is the same for all parts of the circuit or the same current through each support.

# CH- MAGNETIC EFFECTS

## Activity 13.1

- Take a straight thick copper wire and place it between the points X and Y in an electric circuit, as shown in Fig. 13.1. The wire XY is kept perpendicular to the plane of paper.
- Horizontally place a small compass near to this copper wire. See the position of its needle.
- Pass the current through the circuit by inserting the key into the plug.
- Observe the change in the position of the compass needle.

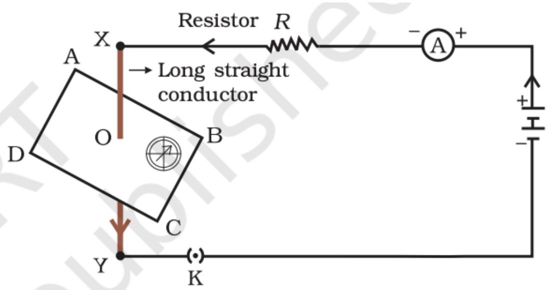



***Figure 13.1***
*Compass needle is deflected on passing an electric current through a metallic conductor*

As you cross the stream, the compass needle deviates. It means the electricity current of copper wire produces a magnetic effect.

## Activity 13.2

- Fix a sheet of white paper on a drawing board using some adhesive material.
- Place a bar magnet in the centre of it.
- Sprinkle some iron filings uniformly around the bar magnet (Fig. 13.2). A salt-sprinkler may be used for this purpose.
- Now tap the board gently.
- What do you observe?

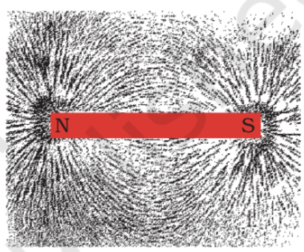



***Figure 13.2***
*Iron filings near the bar magnet align themselves along the field lines.*

The metal files next to the magnet correspond to the field lines because Magnetism has its influence on the environment. So, experience iron filings power. Make metal files to arrange the pattern.

## Activity 13.7

- Take a small aluminium rod AB (of about 5 cm). Using two connecting wires suspend it horizontally from a stand, as shown in Fig. 13.12.
- Place a strong horse-shoe magnet in such a way that the rod lies between the two poles with the magnetic field directed upwards. For this put the north pole of the magnet vertically below and south pole vertically above the aluminium rod (Fig. 13.12).
- Connect the aluminium rod in series with a battery, a key and a rheostat.
- Now pass a current through the aluminium rod from end B to end A.
- What do you observe? It is observed that the rod is displaced towards the left. You will notice that the rod gets displaced.
- Reverse the direction of current flowing through the rod and observe the direction of its displacement. It is now towards the right.
  Why does the rod get displaced?



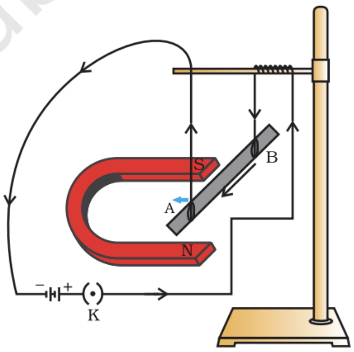



***Figure 13.12***
*A current-carrying rod, AB, experiences a force perpendicular to its length and the magnetic field. Support for the magnet is not shown here, for simplicity.*

The displacement of the rod (AB) suggests that:

- A force is exerted on the current-carrying aluminium rod when it is placed in a magnetic field.
- The direction of force is also reversed when the direction of current through the conductor is reversed.

## Activity 13.8

- Take a coil of wire AB having a large number of turns.
- Connect the ends of the coil to a galvanometer as shown in Fig. 13.16.
- Take a strong bar magnet and move its north pole towards the end B of the coil. Do you find any change in the galvanometer needle?
- There is a momentary deflection in the needle of the galvanometer, say to the right. This indicates the presence of a current in the coil AB. The deflection becomes zero the moment the motion of the magnet stops.
- Now withdraw the north pole of the magnet away from the coil. Now the galvanometer is deflected toward the left, showing that the current is now set up in the direction opposite to the first.
- Place the magnet stationary at a point near to the coil, keeping its north pole towards the end B of the coil. We see that the galvanometer needle deflects toward the right when the coil is moved towards the north pole of the magnet. Similarly the needle moves toward left when the coil is moved away.
- When the coil is kept stationary with respect to the magnet, the deflection of the galvanometer drops to zero. What do you conclude from this activity?

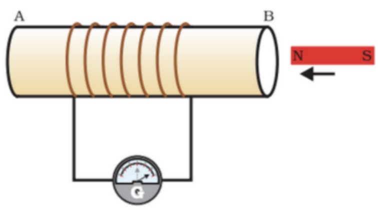



***Figure 13.16***
*Moving a magnet towards a coil sets up a current in the coil circuit, as indicated by deflection in the galvanometer needle.*

If the south pole of the magnet is moved towards the end B, the deflections in the galvanometer would just be opposite to the previous case. When the coil & magnet are

stationary, there is no deflection in the galvanometer. This activity shows that the motion of a magnet with respect to the coil produces an induced potential difference, which sets up an induced electric current in the circuit.

## Activity 13.9

- Take two different coils of copper wire having large number of turns (say 50 and 100 turns respectively). Insert them over a non-conducting cylindrical roll, as shown in Fig. 13.17. (You may use a thick paper roll for this purpose.)
- Connect the coil-1, having larger number of turns, in series with a battery and a plug key. Also connect the other coil-2 with a galvanometer as shown.
- Plug in the key. Observe the galvanometer. Is there a deflection in its needle? You will observe that the needle of the galvanometer instantly jumps to one side and just as quickly returns to zero, indicating a momentary current in coil-2.
- Disconnect coil-1 from the battery. You will observe that the needle momentarily moves, but to the opposite side. It means that now the current flows in the opposite direction in coil-2.

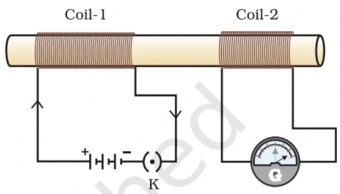



***Figure 13.17***
*Current is induced in coil-2 when current in coil-1 is changed*

As soon as the current in coil-1 reaches either a steady value or zero, the galvanometer in coil-2 shows no deflection.

We conclude that a potential difference is induced in coil-2 whenever the electric current through the coil-1 is changing (starting or stopping). Coil-1 is called the primary coil and coil-2 is called the secondary coil. As the current in the first coil changes, the magnetic field associated with it also changes. Thus the magnetic field lines around the secondary coil also change. Hence the change in magnetic field lines associated with the secondary coil is the cause of induced electric current in it. This process, by which a changing magnetic field in a conductor induces a current in another conductor, is called electromagnetic induction.